



# Road & Bridge Design Publications

## Monthly Update – October 2022

Revisions for the month of **October** are listed and displayed below and will be included in projects submitted for the **February** letting.

E-mail road related questions to [MDOT-Road-Design-Standards@michigan.gov](mailto:MDOT-Road-Design-Standards@michigan.gov).

E-mail bridge related questions to [MDOT-Bridge-Design-Standards@michigan.gov](mailto:MDOT-Bridge-Design-Standards@michigan.gov).

### Special Details

R-112-J: Shoulder and Center Line Corrugations: Revised the offset from a shoulder or centerline corrugation to the outside rail of RR tracks from 25' to 50'. Also revised the corrugation pattern on sheet 4 to match that of the other non-freeway shoulder corrugations.

### Bridge Design Manual

7.02.28 A.: Updated railing uses and preferences.

7.02.31 D.: New guidance on the salvaging and reuse of existing stud type shear developers for partial or complete deck replacements. The intention of salvaging the existing stud type shear developers is to minimize the risk of damage to the existing steel beams/girders.

8.02.R.: New plan note to clarify expectation that bridge elements are not to be subjected to highway loading prior to achieving specified strength. This note is to be added to all projects with any proposed concrete. **Please begin using this note immediately for any projects that have not been let.**

8.03 M.: Added nonstandard datum elevations option.

12.05.01 & 12.05.02: Updated item to Type 6, Replacement vs "Modified". Added criteria that Bridge Railing, Conc Block Retrofit and Bridge Barrier Railing, Type 6, Replacement are the only railings/barriers that can be adhesive anchored.

12.08.09 A.: Updated dimension "H" on the rocker bearing detail.

Updates to the MDOT Cell Library, Sample Plans, and other automated tools may be required in tandem with some of this month's updates. Until such updates can be made, it is the designer's/detailer's responsibility to manually incorporate any necessary revisions to notes and plan details to reflect these revisions.

# Index to Special Details

10-24-2022

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SPECIAL DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
21	2	GUARDRAIL AT INTERSECTIONS	6-6-22
24	8	GUARDRAIL ANCHORED IN BACKSLOPE TYPES 4B, 4T, & 4MGS-8	9-28-18
99	2	CHAIN LINK FENCE WITH WIRE ROPE	9-22-14
R-32-F	8	APPROACH CURB & GUTTER DOWNSPOUTS	9-20-22
R-32-SD	6	APPROACH CURB & GUTTER DOWNSPOUTS (FOR EXISTING RAILINGS)	3-31-22
R-43-J	2	LOCATION OF TRANSVERSE JOINTS IN PLAIN CONCRETE PAVEMENT	1-4-22
R-45-K	2	PAVEMENT REINFORCEMENT FOR BRIDGE APPROACH	1-4-22
R-53-A	22	TEMPORARY CONCRETE BARRIER LIMITED DEFLECTION	8-14-15
R-56-F	6	GUARDRAIL MEDIAN OBJECT PROTECTION	2-5-19
R-60-J	17	GUARDRAIL TYPES A, B, BD, T, TD, MGS-8, & MGS-8D	12-3-21
R-62-H	4	GUARDRAIL APPROACH TERMINAL TYPE 2M	6-16-22
R-63-C	16	GUARDRAIL APPROACH TERMINAL TYPES 3B & 3T	2-5-19
R-66-E	4	GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS	9-28-18
R-67-G	16	GUARDRAIL ANCHORAGE, BRIDGE, DETAILS	9-12-22
R-67-SD	7	GUARDRAIL ANCHORAGE, BRIDGE, DETAILS (FOR EXISTING RAILINGS)	9-12-22
R-72-D	6	GUARDRAIL LONG SPAN INSTALLATIONS	8-23-22
R-73-F	3	GUARDRAIL OVER BOX OR SLAB CULVERTS	8-1-19
R-80-F	8	GRANULAR BLANKETS, UNDERDRAINS, OUTLET ENDINGS, & BULKHEADS	6-28-21
R-100-I	4	SEEDING AND TREE PLANTING	8-3-21
R-110-B	3	PAVEMENT SAFETY EDGE	6-14-21
*R-112-J	10	SHOULDER AND CENTER LINE CORRUGATIONS	9-7-22
R-126-I	5	PLACEMENT OF TEMPORARY CONCRETE & STEEL BARRIER	8-25-15

\* Denotes New or Revised Special Detail to be included in projects for (beginning with) the February letting.

Notes:

Former Standard Plans IV-87, IV-89, IV-90, and IV-91 Series, used for building cast-in-place concrete head walls for elliptical and circular pipe culverts, are now being replaced with plans that detail each specific size. The Bureau of Bridges & Structures, Structure Design Section, Special Structures Unit will provide special details for inclusion in construction plans for MDOT jobs. To assure prompt delivery, requests **must be made in advance**. Contact: [MDOT-TriezenbergSquad@michigan.gov](mailto:MDOT-TriezenbergSquad@michigan.gov)

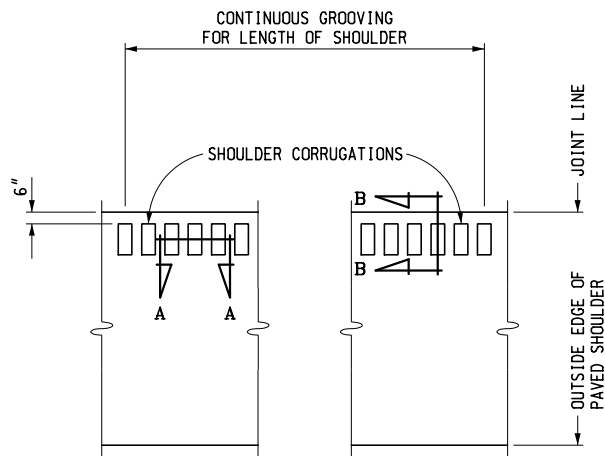
Former Standard Plans IV-93 and IV-94 series have been replaced with precast concrete box & three-sided culverts as per the 2020 Standard Specifications for Construction.

# Index to Bridge Detail Sheets

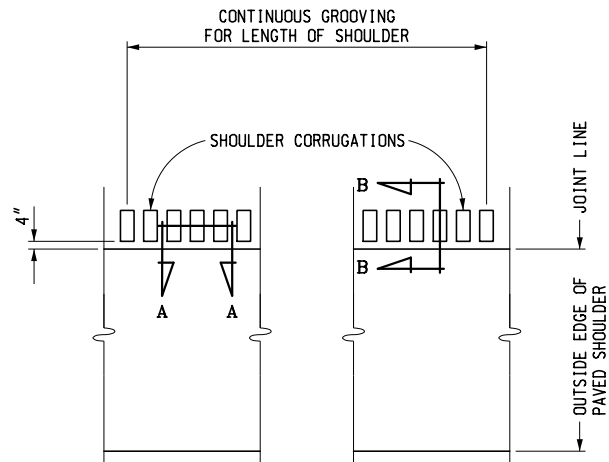
10-24-2022

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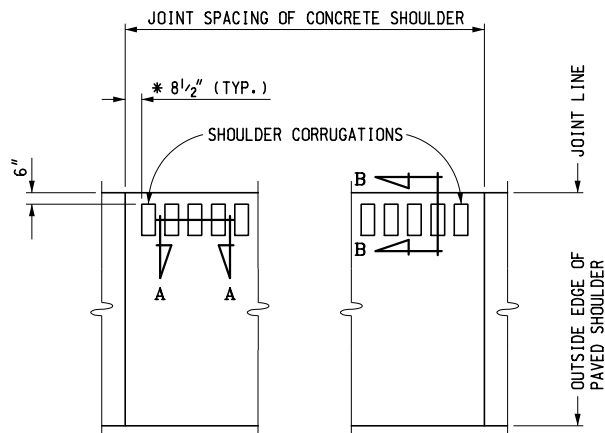
DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
B-28-A	7	BRIDGE BARRIER RAILING, TYPE 7	8-24-20
B-29-A	8	BRIDGE BARRIER RAILING, TYPE 6	8-24-20
EJ3AE	1 to 4	EXPANSION JOINT DETAILS (See Notes)	7-25-22
EJ4R	1 to 4	EXPANSION JOINT DETAILS (See Notes)	7-25-22
PC-1M	1	PRESTRESSED CONCRETE I-BEAM DETAILS (See Notes)	8-23-17
PC-2H	1	70" PRESTRESSED CONCRETE I-BEAM DETAILS (See Notes)	8-23-17
PC-4F	1	PRESTRESSED CONCRETE 1800 BEAM DETAILS (See Notes)	8-23-17
<p>* Denotes New or Revised Special Detail to be included in projects for (beginning with) the February letting.</p> <p>Notes: Details EJ3AE &amp; EJ4R are interactive, i.e., designers and detailers choose details based upon railing type and angle of crossing and fill in the project specific dimensions for the end plate. Place all details appropriate for the project (including the end plate), structure specific information, and the Expansion Joint Device quantity on the sheet. Add the sheet to the plans as a normal plan sheet. Call out and designate the location of the expansion joint device and the end plate on the Superstructure Sheet in the plan set.</p> <p>Details PC-1M, PC-2H, and PC-4F shall have structure specific information and quantities added to the sheet. The sheet shall then be added to the plans as a normal plan sheet.</p>			



HMA SHOULDER PLAN  
ADJACENT TO 12' LANE

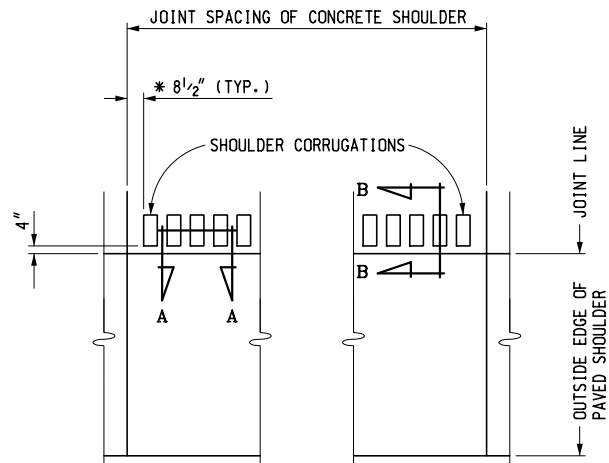


HMA SHOULDER PLAN  
ADJACENT TO 14' LANE



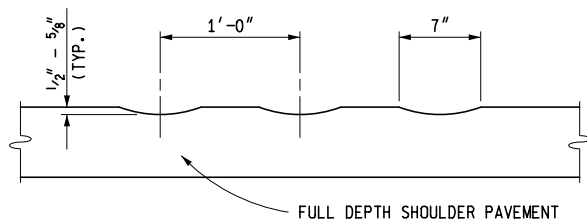
CONCRETE SHOULDER PLAN  
ADJACENT TO 12' LANE

\* THE DISTANCE FROM THE CORRUGATION TO THE TRANSVERSE JOINT SHALL BE AT LEAST 6" BUT LESS THAN 12".

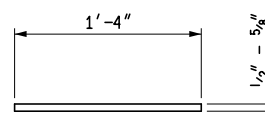


CONCRETE SHOULDER PLAN  
ADJACENT TO 14' LANE

\* THE DISTANCE FROM THE CORRUGATION TO THE TRANSVERSE JOINT SHALL BE AT LEAST 6" BUT LESS THAN 12".



SECTION A - A



SECTION B - B

## FREEWAY SHOULDER CORRUGATIONS (FOR FREEWAY SHOULDERS PAVED 4 FEET OR GREATER)



PREPARED  
BY  
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR  
Paul C. Ajegba

APPROVED BY: \_\_\_\_\_  
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: \_\_\_\_\_  
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

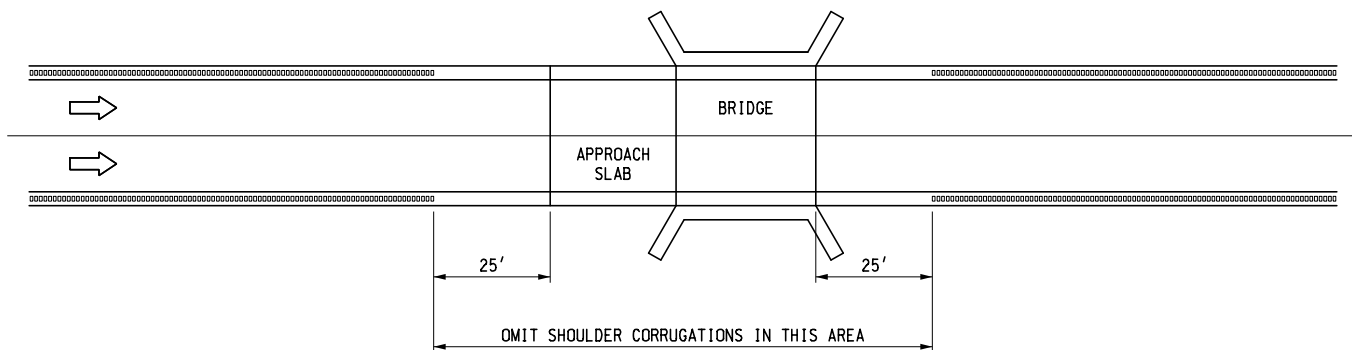
## SHOULDER AND CENTER LINE CORRUGATIONS

F.H.W.A. APPROVAL

9-7-2022  
PLAN DATE

R-112-J

SHEET  
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SHOULDER CORRUGATIONS AT BRIDGES  
 FREEWAY SHOULDER CORRUGATIONS  
 (FOR FREEWAY SHOULDERS PAVED 4 FEET OR GREATER)

MICHIGAN DEPARTMENT OF TRANSPORTATION  
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR

SHOULDER AND CENTER LINE  
 CORRUGATIONS

F.H.W.A. APPROVAL

9-7-2022  
 PLAN DATE

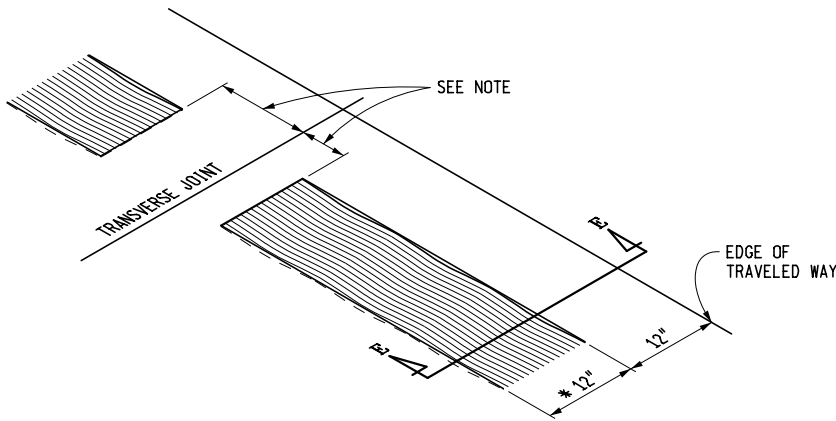
R-112-J

SHEET  
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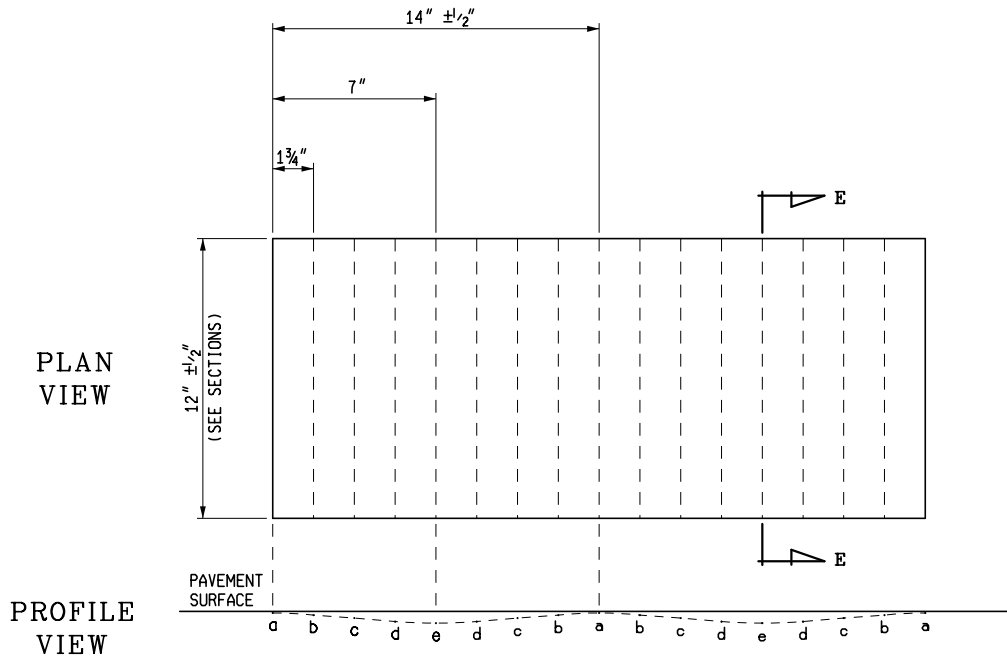
\* LATERAL DEVIATION SHALL NOT EXCEED 1" IN 100'.

NOTE:

ON CONCRETE PAVEMENTS, THE DISTANCE FROM A SHOULDER CORRUGATION TO A TRANSVERSE JOINT SHALL BE AT LEAST 6" BUT LESS THAN 12".

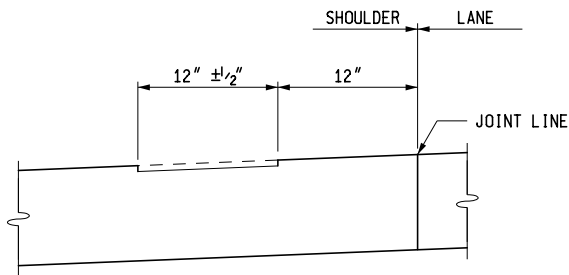


## TYPICAL NON-FREEWAY SHOULDER CORRUGATION INSTALLATION



LOCATION	DEPTH AT EDGE	
	MILS	INCHES *
a	62.5	1/16
b	156	5/32
c	281	9/32
d	438	7/16
e	500	1/2

\* ± 1/8"



## SECTION E-E CONCRETE & HMA SHOULDER

## SINUSOIDAL CORRUGATIONS

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

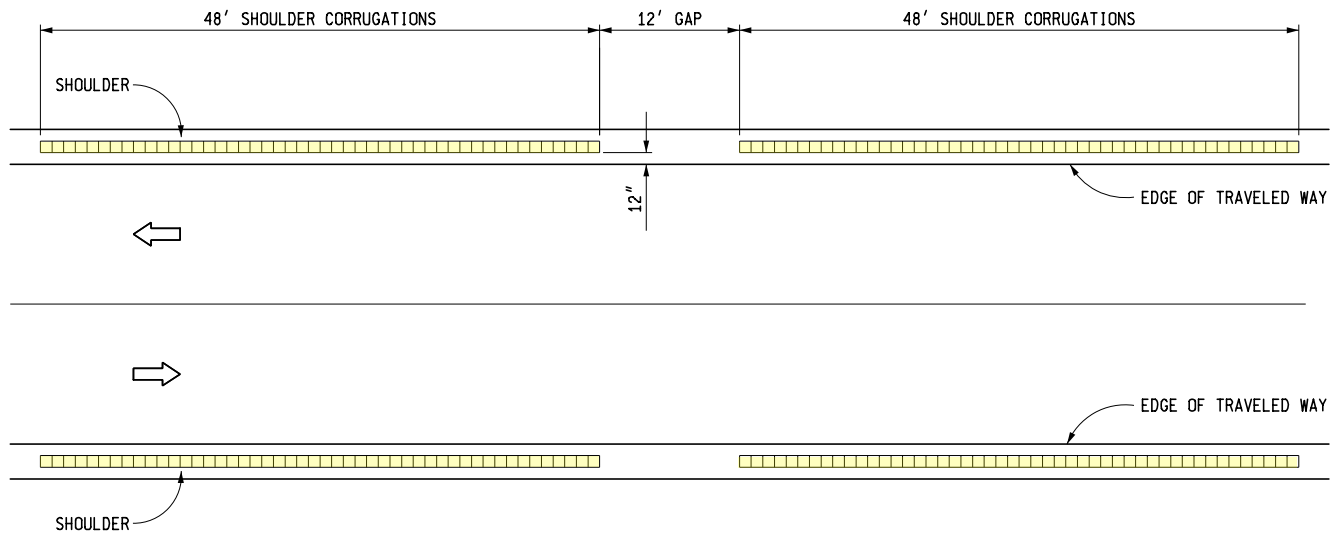
## SHOULDER AND CENTER LINE CORRUGATIONS

F.H.W.A. APPROVAL

9-7-2022  
PLAN DATE

R-112-J

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SHOULDER CORRUGATIONS ON TWO-WAY ROADWAYS

NON-FREEWAY SHOULDER CORRUGATIONS

(FOR NON-FREEWAY SHOULDERS PAVED 6 FEET OR GREATER)

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

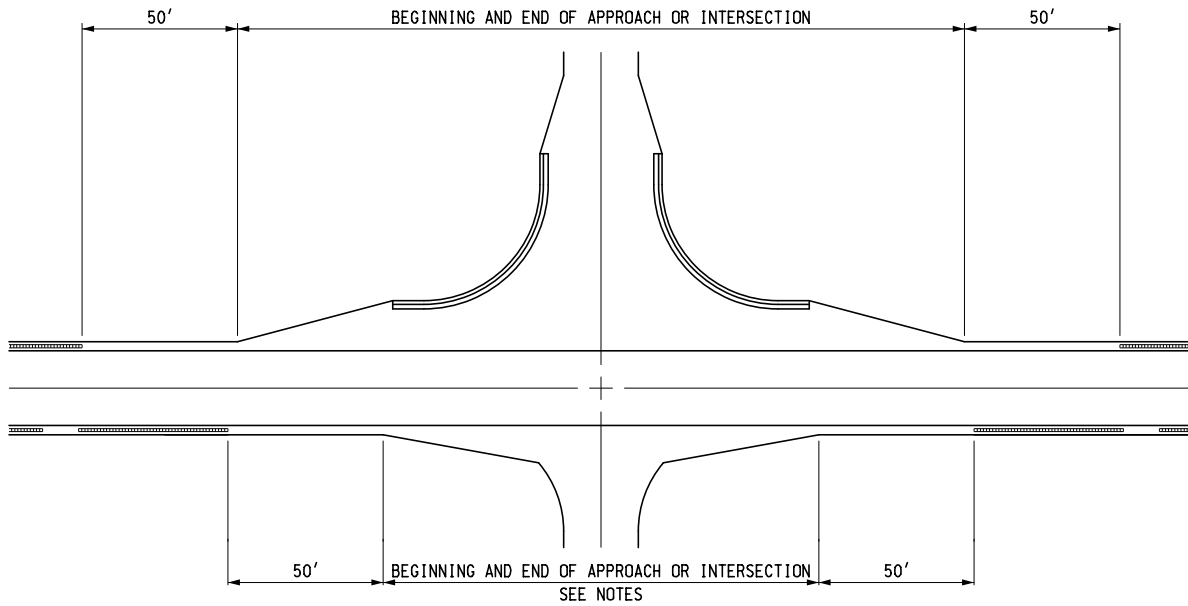
SHOULDER AND CENTER LINE  
CORRUGATIONS

F.H.W.A. APPROVAL

9-7-2022  
PLAN DATE

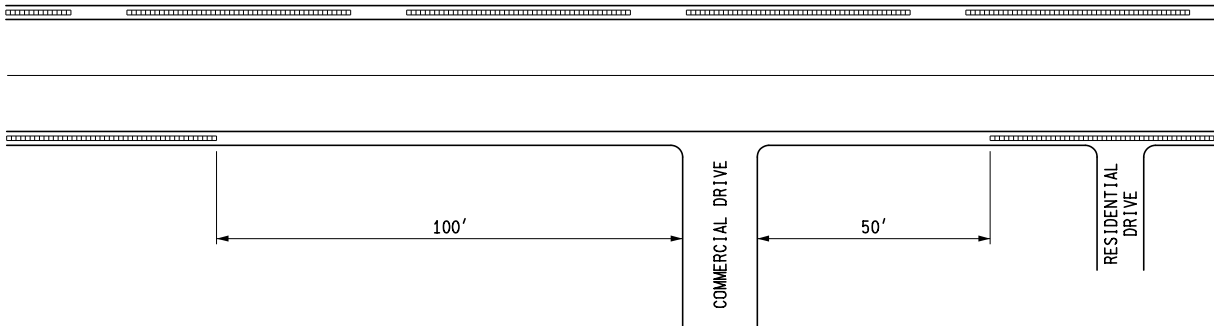
R-112-J

SHEET  
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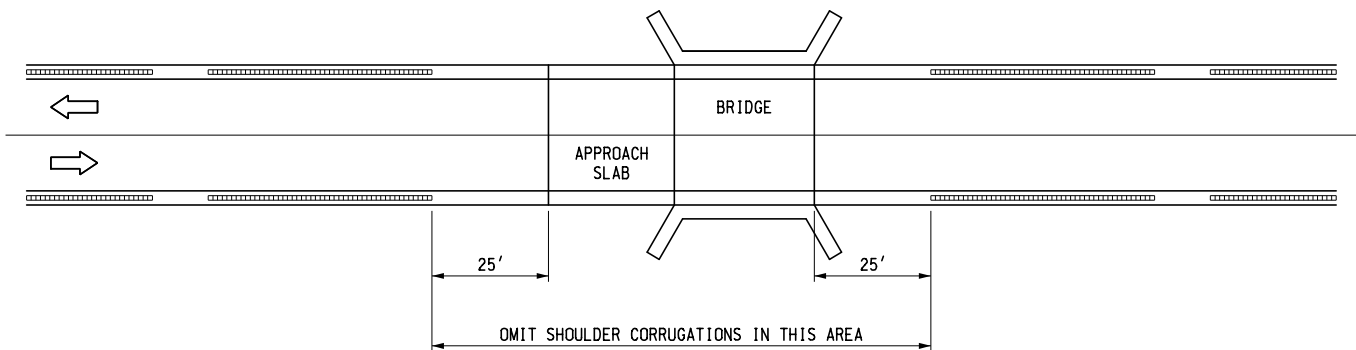


**NOTE:**

SHOULDER CORRUGATIONS MAY BE OMITTED IN AREAS WITH HIGH CONCENTRATIONS OF DRIVES, WHEN DIRECTED BY THE ENGINEER.



**SHOULDER CORRUGATIONS AT INTERSECTIONS**



**SHOULDER CORRUGATIONS AT BRIDGES**

**NON-FREEWAY SHOULDER CORRUGATIONS**  
(FOR NON-FREEWAY SHOULDERS PAVED 6 FEET OR GREATER)

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

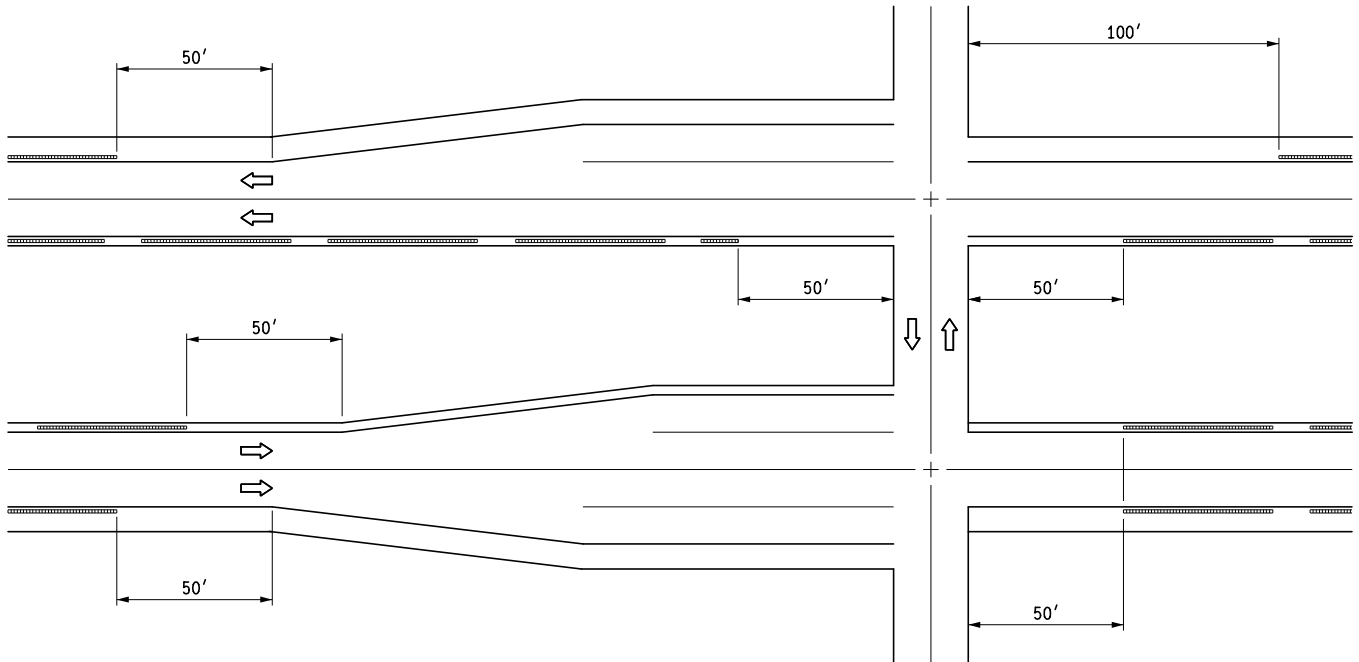
**SHOULDER AND CENTER LINE  
CORRUGATIONS**

F.H.W.A. APPROVAL

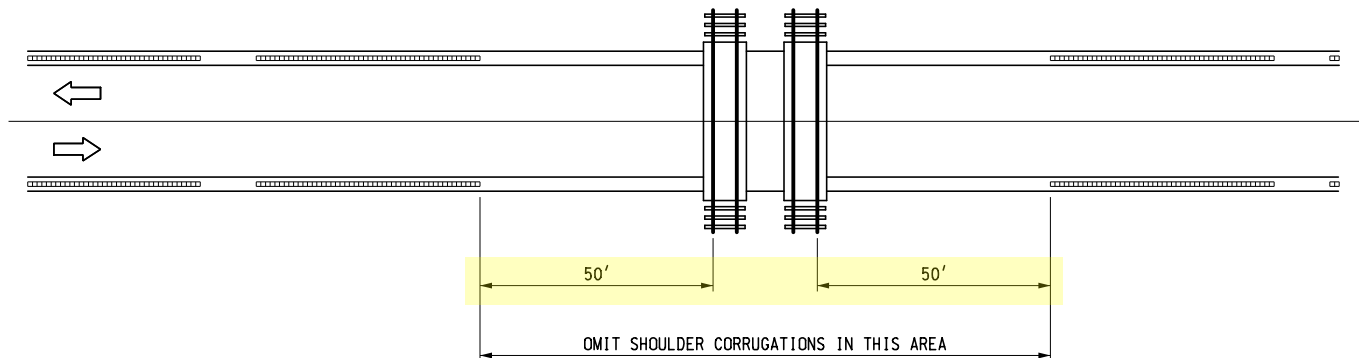
9-7-2022  
PLAN DATE

**R-112-J**

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SHOULDER CORRUGATIONS AT INTERSECTIONS



SHOULDER CORRUGATIONS AT RAILROADS

# NON-FREEWAY SHOULDER CORRUGATIONS (FOR NON-FREEWAY SHOULDERS PAVED 6 FEET OR GREATER)

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

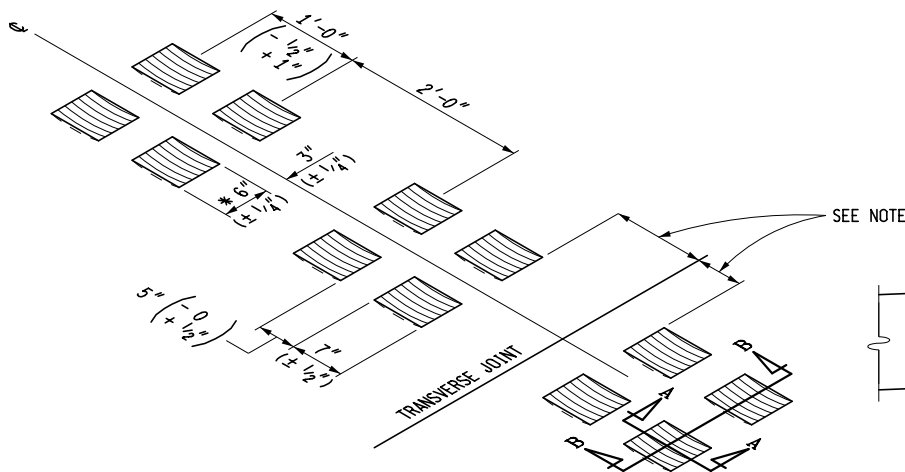
## SHOULDER AND CENTER LINE CORRUGATIONS

F.H.W.A. APPROVAL

9-7-2022  
PLAN DATE

R-112-J

SHEET  
6 OF 10



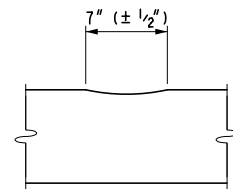
### TYPICAL NON-FREEWAY CENTER LINE CORRUGATION INSTALLATION FOR CONCRETE PAVEMENT

\* LATERAL DEVIATION SHALL NOT EXCEED 1" IN 100'.

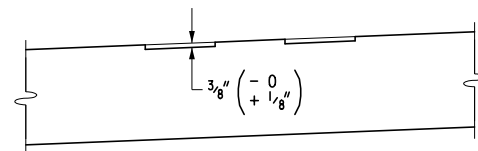
#### NOTES:

ON CONCRETE PAVEMENTS, THE DISTANCE FROM A CENTER LINE CORRUGATION TO A TRANSVERSE JOINT SHALL BE AT LEAST 6" BUT LESS THAN 12".

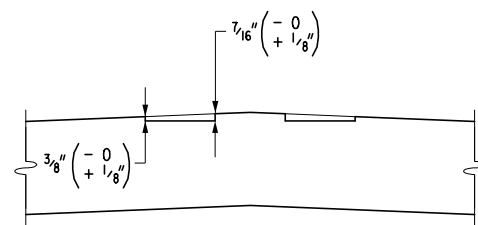
ON CONCRETE PAVEMENTS, CORRUGATIONS MAY BE CONSTRUCTED IN TWO PASSES AND THEREFORE NOT BE SYMMETRICAL ACROSS THE CENTER LINE.



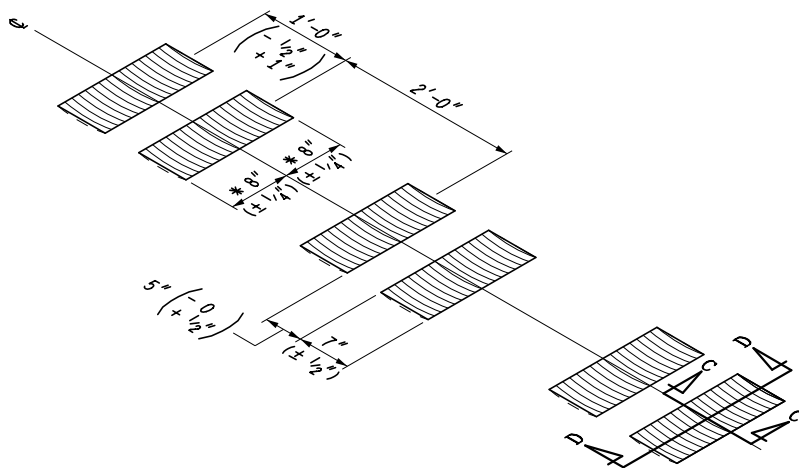
SECTION A-A



SECTION B-B  
SUPERELEVATED ROADWAY

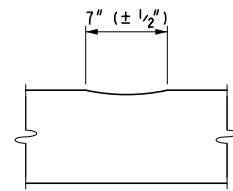


SECTION B-B  
CROWNED ROADWAY

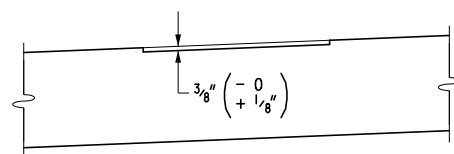


### TYPICAL NON-FREEWAY CENTER LINE CORRUGATION INSTALLATION FOR HMA PAVEMENT

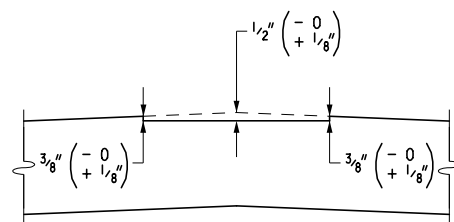
\* LATERAL DEVIATION SHALL NOT EXCEED 1" IN 100'.



SECTION C-C



SECTION D-D  
SUPERELEVATED ROADWAY



SECTION D-D  
CROWNED ROADWAY

## NON-FREEWAY CENTER LINE CORRUGATIONS

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

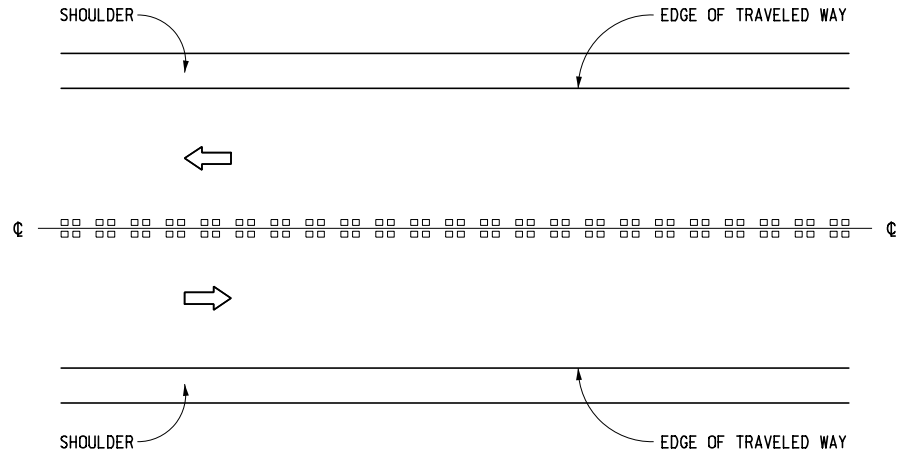
## SHOULDER AND CENTER LINE CORRUGATIONS

F.H.W.A. APPROVAL

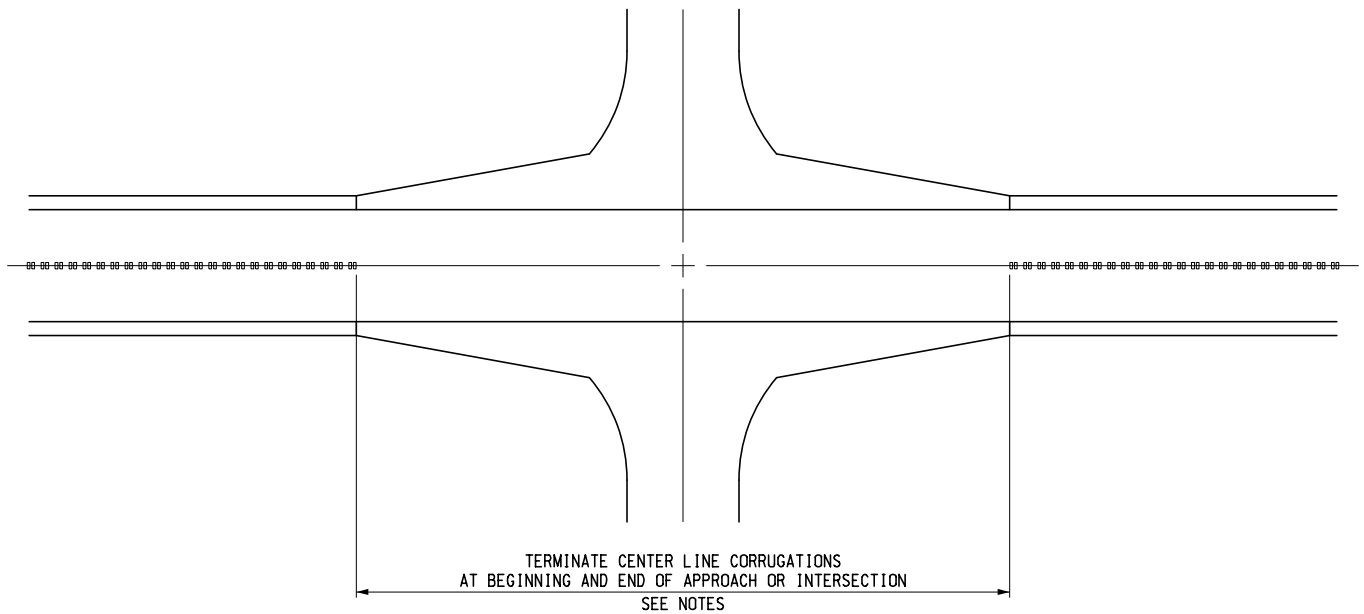
9-7-2022  
PLAN DATE

R-112-J

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### CENTER LINE CORRUGATIONS ON TWO-WAY ROADWAYS



### CENTER LINE CORRUGATIONS AT INTERSECTIONS

## NON-FREEWAY CENTER LINE CORRUGATIONS

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

## SHOULDER AND CENTER LINE CORRUGATIONS

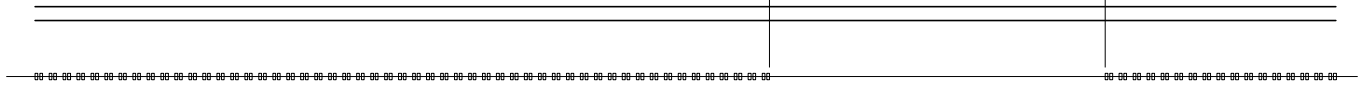
F.H.W.A. APPROVAL

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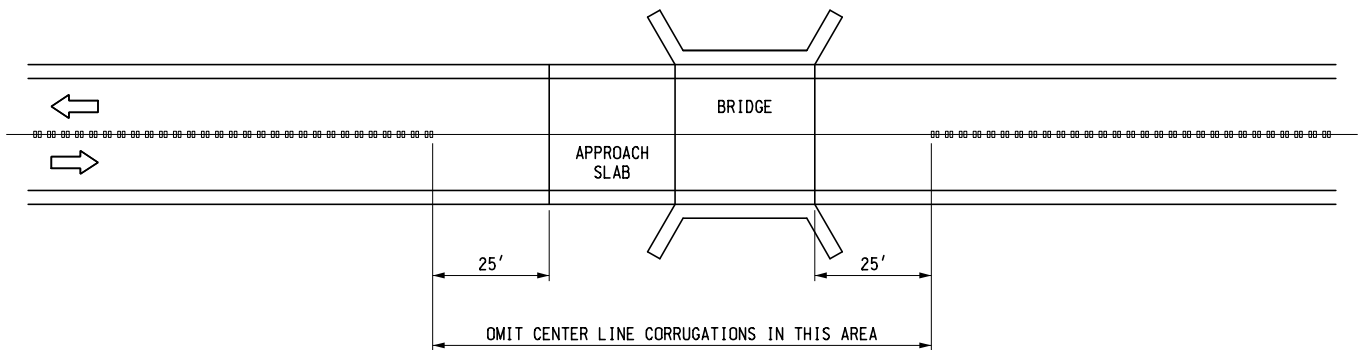
TERMINATE CENTER LINE CORRUGATIONS  
3 TIMES WIDTH OF COMMERCIAL DRIVE  
OR AS DIRECTED BY THE ENGINEER  
SEE NOTES



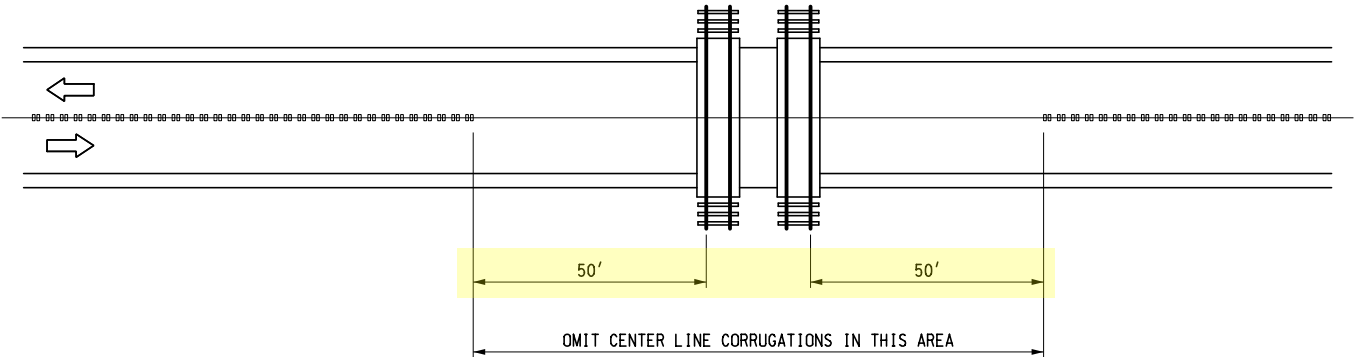
RESIDENTIAL  
DRIVE

COMMERCIAL  
DRIVE

## CENTER LINE CORRUGATIONS AT DRIVEWAYS



## CENTER LINE CORRUGATIONS AT BRIDGES



## CENTER LINE CORRUGATIONS AT RAILROADS

## NON-FREEWAY CENTER LINE CORRUGATIONS

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

## SHOULDER AND CENTER LINE CORRUGATIONS

F.H.W.A. APPROVAL

9-7-2022  
PLAN DATE

R-112-J

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NOTES: (NON-FREEWAY)

SHOULDER CORRUGATION CROSS-SECTIONS AND LOCATIONS SHALL BE AS DETAILED ON THIS STANDARD. CORRUGATIONS ON NON-FREEWAYS SHALL BE IN CONCRETE AND HMA SHOULDERS PAVED AT LEAST 6'-0" WIDE WITH A POSTED SPEED OF 55 MPH. CORRUGATIONS CAN BE USED IN OTHER SITUATIONS WHERE THEY HAVE BEEN PREVIOUSLY APPROVED USING CURRENT GUIDELINES.

CORRUGATIONS SHALL NOT BE PLACED OVER A TRANSVERSE SHOULDER JOINT.

DO NOT MILL SHOULDER OR CENTER LINE CORRUGATIONS THROUGH ANY INTERSECTION, MARKED CROSSWALK, NON-MOTORIZED PATH CROSSING, OR SNOWMOBILE CROSSING.

NOTES: (FREEWAY)

SHOULDER CORRUGATION CROSS-SECTIONS AND LOCATIONS SHALL BE AS DETAILED ON THIS STANDARD. CORRUGATIONS ON FREEWAYS SHALL BE IN CONCRETE AND HMA SHOULDERS PAVED 4'-0" OR WIDER OR WHERE THE SHOULDER LIES BETWEEN THE PAVEMENT AND VALLEY GUTTER OR CURB AND GUTTER. CORRUGATIONS WILL NOT BE USED IN FREEWAY EXIT/ENTRANCE RAMP SHOULDERS OR WHERE SHOULDERS ARE SEPARATED FROM THE PAVEMENT BY VALLEY GUTTER OR CURB AND GUTTER. EXCEPT FOR LOOP RAMP, CORRUGATIONS WILL BE USED ON FREEWAY TO FREEWAY RAMP.

CORRUGATIONS SHALL NOT BE PLACED OVER A TRANSVERSE SHOULDER JOINT.

CORRUGATION LOCATION IN THE AREA OF FREEWAY RAMP WILL BE AS FOLLOWS: THE TYPICAL OFFSET WILL BE INCREASED TO 24" AND BE LOCATED ON THE SHOULDER SIDE OF THE JOINT BEGINNING 300' IN ADVANCE OF THE EXIT RAMP TAPER. THIS OFFSET WILL CONTINUE UNTIL THE 2' POINT OF THE GORE. FOR EXIT/ENTRANCE RAMP AND LOOPS RAMP, THE CORRUGATIONS WILL END ALONG THE RAMP AT THIS POINT AND SIMULTANEOUSLY RESUME ON THE MAINLINE SHOULDER AND GORE WITH THE NORMAL OFFSET. THE CONFIGURATION FOR ENTRANCE RAMP WILL BE IN THE REVERSE ORDER OF THE EXIT RAMP. FOR FREEWAY TO FREEWAY RAMP, IN ADDITION TO RESUMING THE MAINLINE SHOULDER CORRUGATION AT THIS POINT, RETURN TO THE NORMAL MAINLINE OFFSET ALONG THE LENGTH OF THE RAMP SHOULDER.

WITHIN AN URBAN FREEWAY AREA OR OTHER LIMITED FREEWAY AREA, SHOULDER CORRUGATIONS MAY BE OFFSET UP TO 12" FROM THE EDGE OF THE TRAVEL LANE, AS SHOWN IN THE PLANS, OR AS DIRECTED BY THE ENGINEER. IF NEEDED, THE CORRUGATION MAY BE LOCATED ON THE OPPOSITE SIDE OF THE JOINT FOR 14' LANES TO MAINTAIN THE MINIMUM OFFSET TO THE JOINT LINE.

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

SHOULDER AND CENTER LINE  
CORRUGATIONS

F.H.W.A. APPROVAL

9-7-2022  
PLAN DATE

R-112-J

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## MICHIGAN DESIGN MANUAL BRIDGE DESIGN - CHAPTER 7: LRFD

### 7.02.28

#### Railing (9-2-2003) (11-25-2019)

Where bridge railing is to be installed, and there are no sidewalks or the sidewalk is behind the railing, the railing shall be one of the bridge railing types currently approved for use by MDOT. The only types of railings currently used by MDOT are the Type 6 Barrier (see Standard Plan B-29-Series), Type 7 Barrier (see Standard Plan B-28-Series), the 2 Tube railing (see Standard Plan B-21-Series), 4 Tube railing (see Standard Plan B-26-series), Aesthetic Parapet Tube railing (see Standard Plan B-25-Series) and 3 Tube With Pickets (see Standard Plan B-27-Series).

Where bridge railing is to be installed on raised sidewalks it must be 4 Tube railing (see Standard Plan B-26-series) Aesthetic Parapet Tube railing (see Standard Plan B-25-Series) or 3 Tube With Pickets (see Standard Plan B-27-Series).

#### A. Railing Types and Their Use (9-2-2003) (11-25-2019) (10-24-2022)

Generally, Bridge Barrier Railing, Type 6, is used on all new structures and reconstruction (major rehabilitation) bridge projects without sidewalks (see Standard Plan B-29-Series). On structures where sight distance or clear roadway width is a problem, Type 7 may be substituted (see Standard Plan B-28-Series). **Bridge Barrier Railing, Type 6 and Type 7 are preferred on freeways and interstate routes.** At stream crossings or scenic areas, Bridge Railing, 2 Tube, Aesthetic Parapet Tube, 4 Tube or 3 Tube With Pickets may be used (see Standard Plan B-21-Series, B-25-Series, B-26-Series or B-27-Series). **Do not use Bridge Railing, 2 Tube on freeways and interstate routes or adjacent to pedestrian traffic (the height is insufficient).** On bridges where pedestrian or bicycle traffic is separated from vehicular traffic by a standard barrier, it is not necessary to provide a vehicular railing at the fascias. In such cases pedestrian fencing is desirable.

For structures without sidewalks, but where some pedestrian traffic is likely, a Bridge Railing, 4 Tube, Aesthetic Parapet Tube or 3 Tube With Pickets is to be used.

### 7.02.28 (continued)

#### B. Joints (6-27-2022)

To avoid cracking, an open joint is required in concrete railings at all deck joints where reinforcing steel is not continued through the joint. False joints are not required in barrier railing.

A 1" joint shall be used in all concrete railings over the piers of continuous decks, at midspan on all structures with a span greater than 100'-0" and cantilever decks where the cantilever is more than 10'-0" long. The joint shall be perpendicular to the centerline even on skewed bridges. A 1" joint filler shall be used to fill the joint to ½" from the bevels of the railing. The remaining ½" shall be sealed with a polyurethane or polyurethane hybrid sealant. (5-1-2000) (2-21-2017)

#### C. Median Barrier vs. Bridge Barrier Railing (5-6-99)

Criteria for use:

1. Concrete barrier on a bridge shall be reinforced and attached to the structure.
2. Barriers that function as railings shall be at least 3'-6" in height.
3. Barriers that function as median barriers shall be at least 2'-8" in height.
4. Concrete glare screens required on approaches shall be continued across structures.
5. When structures are 150'-0" or less apart (along traveled roadway) a concrete barrier (Concrete Barrier, Single Face or approved alternate) should be used between the two structures, in lieu of guardrail to provide continuity. Approval by the agency having jurisdiction of the approaches is required.

## MICHIGAN DESIGN MANUAL BRIDGE DESIGN - CHAPTER 7: LRFD

### 7.02.31 Deck Replacements (Cont.)

#### D. Salvaging Shear Developers (10-24-2022)

For full or partial deck replacements on steel superstructures with stud type shear developers, shear developers should be left in place and reused whenever possible to minimize the risk of damage (and associated delays) to the steel beams/girders. For steel superstructures with spiral/coil type shear developers, remove the spirals/coils and install stud type shear developers using the appropriate pay items included in the MDOT Standard Specifications for Construction. If shear developer type cannot be confirmed with existing plans, contact the MDOT Bridge Construction Engineer to request a field investigation to confirm existing shear developer type.

The removal, furnishing, and installation of the additional shear developers is included in the special pay items listed in the Frequently Used Special Provision for Bridge Deck Removal and Salvaging Shear Developers on Steel Beams. Include a quantity equal to approximately 5% of the original shear stud total to account for existing damaged or deteriorated studs that must be removed and replaced. If additional studs are needed to meet strength requirements per AASHTO and Section 7.02.15, add quantity and detail proposed studs in relation to the existing studs on the plans. The location of the additional shear developers must account for the minimum spacing and edge distance requirements specified in AASHTO LRFD.

Where the existing shear developers are not tall enough to extend sufficiently into the new bridge deck per Bridge Design Guide 8.07.01, add EA04, EW05, and EK05 bars to haunch, similar to Bridge Design Guide 6.42.03A.

## MICHIGAN DESIGN MANUAL BRIDGE DESIGN

### 8.02 (continued)

#### TITLE SHEET

- K. Bevel all exposed concrete corners shown square on the plans with  $\frac{1}{2}$ " triangular moldings except as otherwise noted. (8-20-99)
- L. Old plans do not exist for this structure. [Use on all projects where the designer is unable to verify that existing structure plans exist.] (8-20-2009)
- M. The bridge paint may contain lead. [Use on all projects with existing painted structural steel regardless of work type. If no bridge Title Sheet is present with project place note on road Note Sheet. Also place on existing structural steel sheets (see note [8.09.06 D.](#))] (8-20-2009)
- N. Unless otherwise shown on the plans, provide minimum concrete clear cover for reinforcement according to the following:  

Concrete cast against earth:	3 in.
Prestressed Beams:	1 in.
All other unless shown on plans:	2 in.

(8-20-2009)
- O. The bridge deck surface has an HMA overlay, HMA cap or HMA patches. Removal of HMA as a result of removal of other superstructure items is included in the removal of those items. (8-20-2009)
- P. (FAA Obstruction) (,) (and) (Michigan Tall Structure) (,) (and) (Municipal Airport) permit(s) (have) (has) been obtained for this project. Perform all work in compliance with (this) (these) permit(s). [Use when applicable permits have been obtained for project] (3-20-2017)
- Q. This project has been evaluated using the FAA Notice Criteria Tool for a structure height of \_\_\_\_ feet above a ground level elevation of \_\_\_\_ feet and no permits are required. [Use when FAA Obstruction, Michigan Tall Structure or Municipal Airport permits are not required for the project.] (3-20-2017)

### 8.02 (continued)

- R. Do not open structure(s) to traffic until all proposed concrete attains 100% of its specified strength. [Use for all projects that have proposed superstructure or substructure concrete, bridge barrier railings, or any other concrete material that has a strength specified in the contract.] (10-24-2022)

## MICHIGAN DESIGN MANUAL BRIDGE DESIGN

### 8.03

#### GENERAL PLAN OF SITE SHEET

- A. The work covered by these plans includes (channel excavation), (maintaining traffic), construction of the proposed bridge and placing (slope protection) (scour countermeasures) (riprap) to the limits shown. All other work is included in the road plans that are a part of this contract. [Used where bridge is part of a road-bridge package.]
- B. The work covered by these plans includes (clearing), (grubbing), (tree removal), (channel excavation), (earth excavation), (maintaining traffic), (construction of the temporary road), (construction and removal of temporary trestle), (grading for temporary and permanent track work), construction of the proposed bridge and placing (granular material), (sodding or seeding) and (slope protection) (scour countermeasures) (riprap) to the limits shown. All other work is to be done by others and is not a part of this contract. [Used where bridge contractor constructs bridge only and approach work is done by a separate contract. Any work that is to be done by others prior to starting work on bridge contract is to be noted.] (4-19-2021)
- C. Removal of (fences and) buildings is not a part of this contract.
- D. Removal of temporary structure and approaches (is) (is not) a part of this contract.
- E. Locate all active underground utilities prior to starting work and conduct operations in such a manner as to ensure that those utilities not requiring relocation will not be disturbed.
- F. Remove unsuitable material under \_\_\_\_\_ and backfill with \_\_\_\_\_.

### 8.03 (continued)

- G. Remove (\_\_\_\_\_ cubic yards of) peat and other unsuitable material below proposed approach fill location and backfill with (\_\_\_\_\_ cubic yards of) "Embankment, Structure, CIP" (see Road Plans for treatment limits, method and quantity). [Use when large peat deposits must be removed by surcharging.] (12-5-2005)
- H. (Scarify\*) (Remove) roadway surfacing in area beneath proposed abutments prior to placing of fills. [Use for pile-supported abutments or where fill is 3'-0" or less.] [\*Use when roadway surfacing is gravel or crushed stone with or without a seal coat.] (8-6-1992)
- I. Construct and backfill piers 1 and \_\_\_\_\_ prior to the placement of abutment fills. [Use where piers are within or at toes of slope.]
- J. Grade the ground adjacent to the tracks and structure to provide drainage.
- K. (Maintain) (Detour) ..... traffic over (the bridge) (the bridge by part-width construction) (other existing roads) (the temporary road). [Specify facility and other modes of transportation on the project. Use multiple notes if modes are detoured or maintained in separate ways.] (12-16-2019)
- L. This bridge is part of an interchange and all area shown is within MDOT right-of-way.
- M. (Proposed) Plan elevations refer to \_\_\_\_\_ datum. (To obtain \_\_\_\_\_ elevations from existing plans, subtract \_\_\_\_\_ feet from existing plan elevations.) [Use correction parts of note when proposed plan elevations are not normal MDOT convention.] (10-24-2022)

# MICHIGAN DESIGN MANUAL

## BRIDGE DESIGN

### 12.05

#### RAILING UPGRADING (11-25-2019)

Bridge railings shall be upgraded where the existing facility is found to be inadequate, either because of crash experience or because it is not a current MDOT approved railing. Upgrading will be scheduled according to the following guidelines:

- A. Railings shall be upgraded at any location where a revised railing can be expected to reduce the severity of crashes.
- B. Railings shall be upgraded at any location within safety upgrading projects.
- C. Railings shall be upgraded when bridge reconstruction of any nature is planned.
- D. Railings shall be upgraded where pedestrian screening is added to a bridge.

The decision to retain, retrofit, or replace existing railing depends on the type and condition of the railing and the curb or sidewalk treatment.

Where replacement is required, the proposed railing must be a current MDOT approved railing. (5-1-2000)

### 12.05.01

#### Approved MDOT Railings

(5-1-2000) (11-25-2019) (9-28-2020)

Current MDOT approved railings are:

- A. Bridge Barrier Railing, Type 6 (B-29-Series)
- B. Bridge Barrier Railing, Type 7 (B-28-Series)
- C. Bridge Railing, Aesthetic Parapet Tube (B-25-Series)
- D. Bridge Railing, 2 Tube (B-21-Series)
- E. Bridge Railing, Thrie Beam Retrofit (B-22&23-Series)
- F. Bridge Railing, 4 Tube (9-2-2003) (B-26-Series)
- G. Bridge Railing, 3 Tube With Pickets (B-27-Series)
- H. Bridge Railing, Concrete Block Retrofit (B-50-Series)
- I. Bridge Barrier Railing, Type 6, Replacement \* (B-29-Series & Bridge Design Guides)

\* **Type 6, Replacement (adhesive anchored) barrier must only be used for non-NHS routes.** Approval to use **Type 6, Replacement (adhesive anchored)** barriers on NHS routes must be requested from the Chief Structure Design Engineer if the deck overhang cannot be replaced AND the superstructure has appreciable life left (good or fair condition upon completion of the project). Other criteria/circumstances that make replacement of the barrier and necessary portions of the deck not technically feasible may be considered.

**Adhesive anchored railings other than Bridge Railing, Conc Block Retrofit and Bridge Barrier Railing, Type 6, Replacement (subject to the specific conditions listed in the footnote above) are not permitted.**

(12-28-2020) (10-24-2022)

# MICHIGAN DESIGN MANUAL

## BRIDGE DESIGN

### 12.05.02

#### Existing Railings and Upgrading Options (11-25-2019) (9-28-2020) (10-24-2022)

Use the following table to determine railing treatment on projects. Table options are minimum railing upgrading criteria and when circumstances warrant the railing shall be replaced rather than retrofitted or retained.

Option		Offset	Posted Speed	R4 Railing (concrete posts)	R5 Railing (metal posts)	Concrete Parapet Railing	Aluminum Railings (2&3 Tube)	R15 Railing (GM Shape), Type 4 & 5
Reconstruction		All	All	Replace				Replace
Rehabilitation <sup>(6)</sup>	Guardrail Retrofit	Sidewalk/Brushblock ≤ 2'-6" <sup>(1)</sup>	All	Retrofit (Std B-22)	Replace	Retrofit <sup>(2)</sup> (Std B-23)	Replace	Replace or Retain <sup>(4)</sup>
		Sidewalk/Brushblock > 2'-6" <sup>(1)</sup>	≤ 40 mph	Replace or Guardrail <sup>(3)</sup>		Retain		
			> 40 mph	Replace				
	Concrete Block Retrofit, B-50 <sup>(5)</sup>	Sidewalk/Brushblock ≤ 1'-6" <sup>(1)</sup>	All	Remove Railing and Retrofit				
		Sidewalk/Brushblock ≥ 1'-6" <sup>(1)</sup>	All	Remove or Retain Railing and Retrofit				
	Type 6, Replacement (non-NHS only)	All	All	Remove Railing and Replace <sup>(6)</sup>				
Preventive Maintenance		All	All	Retain				Retain

Replace = Replace railing with Standard MDOT approved bridge rail.

Retrofit = Retrofit per Standard Plans B-22, B-23 or B-50 Series.

Retain = Retain existing bridge rail.

Guardrail = Attach thrie beam guardrail directly to concrete posts.

<sup>1</sup> Where sidewalks are required for pedestrian use, they shall provide at least 4'-0" clear distance between the bevel point and the retained, retrofitted or replaced railing. (12-5-2005).

<sup>2</sup> Normally, handrails should not be removed; however, if they are removed, anchor bolts should be left in place. This treatment is accepted as crash tested for Michigan Thrie Beam Retrofit (Std B-23).

<sup>3</sup> Replace railing if circumstances warrant, otherwise attach thrie beam guardrail to railing (concrete posts) with 7/8" diameter bolts. Wood blocks and blockouts shall not be used in guardrail attachment to posts. If approach guardrail is present or being installed, it shall be attached to thrie beam guardrail on bridge; use thrie beam transition and expansion sections as required. If no approach guardrail is present or being installed terminate thrie beam guardrail at end post of railing with thrie beam terminal connector.

<sup>4</sup> Obsolete Standards R15 A - R15 N, X-17 and B-17 Series & X-20 and B-20 Series. Replace if warranted by the condition of the existing barrier and the crash history, retain otherwise.

<sup>5</sup> Sidewalk/brushblock height at curb must be ≥ 10".

<sup>6</sup> Remove sidewalk width as needed for shoulder width.

# MICHIGAN DESIGN MANUAL

## BRIDGE DESIGN

### 12.08.09 (continued)

- A. The vertical line of the reaction falls outside of the middle half of the bearing surface for a majority of the expansion rocker bearings along a line of bearings. The vertical line of the reaction is to be taken as passing through the radius point of the bearing surface as is shown in the figure below. Maximum rocker offsets and rotations for various expansion rocker bearings are given in the table below.

The bearing dimensions used to make the assessment should be the dimensions shown on the as-built plans for the bridge.

If the offset was measured at a time of the year with either extremely high or low temperatures (over 100° F or below 0° F) it is recommended that the offset be checked again when ambient temperatures are more moderate to confirm that offset of the expansion rocker bearing is outside of the limits described above.

"H" Dimension* (in)	Rocker Bearing Plate Width "A1" (in)	Max. Rocker Offset (in)	Max. Rocker Rotation (degrees)
8 1/2"	6"	1 1/2	10
8 1/2"	7"	1 3/4	12
8 1/2"	8"	2	14
12 1/2"	9"	2 1/4	10
12 1/2"	10"	2 1/2	12
12 1/2"	11"	2 3/4	13
12 1/2"	12"	3	14
12 1/2"	13"	3 1/4	15
12 1/2"	14"	3 1/2	16
12 1/2"	15"	3 3/4	18

\*Note: The "H" dimension is the vertical distance between the sole plate and the masonry plate. See the figure below.

